10/510051
2/PRTS DT04 Rec'd PCT/PTO 0 1 OCT 2004

WO 03/090932 PCT/CH02/00185

Drive Unit for Horizontally Turning Bodies of Revolution

The present invention relates to a drive unit according to the preamble of Claim 1.

Large, cylindrical bodies of revolution are used, for example, in ball, rod, or cement mills. Thus, the material being processed is filled into a cylindrical grinding drum, which is arranged to turn about a horizontal axis.

Traditionally, the grinding drum is supported on bearings and has a gear rim generally formed at one end around the circumference, which engages with pinions of the grinding drum's drive unit. In a familiar layout, one pair of pinions engages horizontally sideways with the gear rim of the grinding drum, while the bearings are arranged underneath the lengthwise axis of the grinding drum. Here, the drive unit forms a whole together with the speed-reducing gear train.

This arrangement has the advantage that the drive unit and the gear train are easily moved into the gear rim and can also be easily removed again for maintenance chores or opened up if necessary. However, the large space required at the side and the large height of the required foundation for the gear train act as drawbacks.

The goal of the present invention, now, consisted in finding a drive unit for such a body of revolution that requires less space at the side in terms of the dimensions than is the case with traditional drive units, and whose foundation can be designed to be small and, thus, cost-effective.

This goal is achieved, according to the invention, by a drive unit with the features of Claim 1. Additional, preferred embodiments result from the features of Claims 2 to 7.

Thanks to the arrangement, according to the invention, of the gear train housing at the side underneath the body of revolution, the space needed for the overall layout in the sideways direction is substantially decreased. This is due to the fact that at least part of the housing of the gear train comes to lie in the region underneath the body of revolution, and only a part of it still protrudes sideways beyond the contour of the body of revolution.

Preferably, the drive unit is arranged perpendicularly beneath the body of revolution. As a result, the entire housing of the gear train now generally comes to lie within the contour of the body of revolution and no additional space whatsoever and also no additional foundation are required. This has the further advantage that the pinions, if necessary, can also take on the bearing support of the body of revolution arranged thereon, i.e., the corresponding bearings can be replaced or do not even have to be designed as part of the layout. This leads on the whole to further simplification of the construction of the overall layout.

A further advantage of this arrangement lies in that no additional mounting brackets have to be provided for the drive unit, but instead the drive unit can be

placed on the floor or foundation of the layout directly next to the body of revolution. This facilitates both the installation and the maintenance and repair work on the drive unit.

It has been found, furthermore, that the arrangement according to the invention of the pinions leads to a favorable force relation in the transmitting of the driving force to the body of revolution.

The drive unit according to the invention is basically suitable for all types of layouts with horizontally arranged bodies of revolution, but preferably for layouts of large dimension, such as ball mills or cement mills, according to Claim 8.

An exemplary embodiment of the present invention will be explained more clearly below by means of figures.

Fig. 1 is, schematically, the end view of a drive unit according to the invention; and

Fig. 2 is, schematically, the end view of another preferred embodiment of the drive unit of the invention.

Figure 1 shows the gear train housing 1 of the drive unit for a cylindrical body of revolution 2 in end view relative to the axis of rotation 3 of the body of revolution 2. The body of revolution 2, for example, is the grinding drum of a cement mill, and for better clarity the outer contour of this body of revolution is shown only in dashed lines.

In the gear train housing 1 of the drive unit, the gears are arranged in the form of a speed-reducing gear train, with the two driven gears 4 and 4' protruding in the direction of the axis of rotation 3 of the body of revolution 2. The teeth of the driven gears 4 and 4' now engage with the gear rim 6 (only a portion of which is shown) arranged in this place on the periphery of the body of revolution 2. The engaging of the upper driving gear 4 occurs at an angle α of at least approximately 25° to 40° in relation to the horizontal transverse axis of the body of revolution 2. The lower pinion 4' thus has an angle of engagement of approximately 40° to 55°.

Thanks to this arrangement of the gear train housing 1 of the drive unit according to the invention, the outside of the gear train housing 1 protrudes only slightly to the side from the outer contour of the body of revolution, which amounts to a substantial advantage as compared to traditional drive unit arrangements. Thus, on the whole, the width of such a layout can be reduced as compared to traditional layouts, i.e., the layout requires less installation space for the same length and volume.

Another advantage is that the gear train housing 1, thanks to this arrangement, can be secured directly to the floor or foundation of the layout, and no additional platform is needed for the gear train housing, as is the case with traditional sideways layouts. Thus, the emplacement and installation of the drive unit is likewise facilitated and an easier and better accessibility for maintenance and repair work on the gear train is assured.

Figure 2 is, once again schematically, the front view of another preferred embodiment of the drive unit according to the invention. Here, the two pinions 4 and 4' now engage with the gear rim 6 from the bottom, symmetrically in relation to the vertical axis 7 of the body of revolution 2. Thanks to this arrangement, the two pinions 4 and 4' can serve at the same time as bearings for the body of revolution 2 in this place. Thus, one can advantageously economize on one bearing for the body of revolution 2, and at the same time the sideways space required for the drive unit is further reduced. In the case depicted, the drive unit or the gear train housing 1 now no longer protrudes sideways outside of the side contour line of the body of revolution, so that the space required for such a layout depends solely on the outer dimensions of the body of revolution 2.

Of course, it is conceivable, in the case of smaller layouts, to provide a gear train with only one driven gear 4, or in the case of larger layouts to provide even two drive units, one opposite the other, and engaging with the very same gear rim 6 of the body of revolution 2.

The motor of the drive unit according to the invention is flanged to the drive shaft of the drive train in traditional fashion, preferably via a coupling. Thus, the drive axis will preferably come to lie in parallel with the axis of rotation of the body of revolution 2 and the sideways dimension of the overall drive unit is not increased with respect to the outside dimension of the gear train housing 1.